

Claims

1. An electro-kinetic air transporter-conditioner, comprising:

a housing having an inlet and an outlet;

a voltage generator; and

an electrode assembly electrically connected to said voltage generator, said electrode assembly creates an airflow from said inlet to said outlet when said voltage generator is energized, said electrode assembly including:

a first array of electrodes having at least two first electrodes; and

a second array of electrodes having at least three second electrodes, located downstream and staggered in relation to said first array, wherein one of said second electrodes in said second array is a greater distance downstream from said first array than the remaining of said second electrodes in said second array.

2. The electro-kinetic air transporter-conditioner of claim 1 wherein said one of said second electrodes is located between said remaining second electrode.

3. The electro-kinetic air transporter-conditioner of claim 1 wherein said one of said second electrode is aligned with a line that is mid-way between the first two electrodes.

4. The electro-kinetic air transporter-conditioner as recited in claim 1, wherein said first array of electrodes has at least one electrode that shares at least one characteristic from a group consisting of (i) a rod-shaped wire, (ii) a spiral coil, (iii) a curved wire, and (iv) a flat spiral wire.

5. The electro-kinetic air transporter-conditioner as recited in claim 1, wherein said second array of electrodes includes at least one electrode with a characteristic selected from a group

consisting of (i) an elongated cylindrical tube, (ii) an electrode with a U-shaped cross-section, (iii) an electrode with an L-shaped cross-section, (iv) an electrode with a rod-shaped cross-section, and (v) an electrode with a front section and a tail section located at an angle to the front section.

5        6.        The electro-kinetic air transporter-conditioner as recited in claim 1, wherein the air transporter-conditioner further includes a third focus electrode located upstream of said first array of electrodes.

10       7.        The electro-kinetic air transporter-conditioner as recited in claim 1, wherein the air transporter-conditioner further includes a trailing electrode located downstream of said second array of electrodes.

8.        An electro-kinetic air transporter-conditioner, comprising:

          a housing having an inlet and an outlet;

15           a voltage generator; and

          an electrode assembly electrically connected to said voltage generator, said electrode assembly creates an airflow from said inlet to said outlet when said voltage generator is energized, said electrode assembly includes:

          a first array of electrodes, aligned to define a first plane; and

20           a second array of electrodes, including two outermost second electrodes, each having a nose, said nose of each said outermost second electrodes aligned to define a second plane parallel to said first plane, and an innermost second electrode recessed from said second plane so that the innermost second electrode is further downstream from said first array of electrodes than said outermost second electrodes.

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9.        The electro-kinetic air transporter-conditioner as recited in claim 8, wherein said first array

of electrodes includes at least one electrode that shares at least one characteristic from a group consisting of (i) a rod-shaped wire, (ii) a spiral coil, (iii) a curved wire, and (iv) a flat spiral wire.

10. The electro-kinetic air transporter-conditioner as recited in claim 8, wherein said second  
5 array of electrodes includes at least one electrode with a characteristic selected from a group consisting of (i) an elongated cylindrical tube, (ii) an electrode with a U-shaped cross-section, (iii) an electrode with an L-shaped cross-section, (iv) an electrode with a rod-shaped cross-section, and (v) an electrode with a front section and a tail section located at an angle to the front section.

10 11. The electro-kinetic air transporter-conditioner as recited in claim 8, wherein the air transporter-conditioner further includes a third focus electrode located upstream of said first array of electrodes.

12. The electro-kinetic air transporter-conditioner as recited in claim 8, wherein the air  
15 transporter-conditioner further includes a trailing electrode located downstream of said second array of electrodes.

13. The electro-kinetic air transporter-conditioner as recited in claim 8, wherein said innermost  
20 electrode is 2-12mm further downstream from said first array of electrodes than said outermost electrodes.

14. An electro-kinetic air transporter-conditioner, comprising:  
a housing having an inlet and an outlet;  
a voltage generator disposed within said housing;  
25 an electrode assembly electrically connected to said voltage generator, said electrode assembly creates an airflow from said inlet to said outlet when said voltage generator is energized,

said electrode assembly includes:

a first array of electrodes, including a plurality of first electrodes;

a second array of electrodes including a plurality of second electrodes, having at least one more second electrode than said first plurality of electrodes and staggered in relation to said first array, where in one or more of said second electrodes in said second array is located further from said first array than the other of said plurality of second electrodes.

15. An electro-kinetic air transporter-conditioner, comprising:

a housing having an inlet and an outlet;

a voltage generator disposed within said housing;

an electrode assembly, electrically connected to said voltage generator, said electrode assembly creates an airflow from said inlet to said outlet when said high voltage generator is energized, said electrode assembly includes:

a plurality of ion emitter electrodes; and

a plurality of ion collector electrodes staggered in relation to, and located downstream from, said ion emitter electrodes, one or more of said ion collector electrodes receives ions from principally two of said ion emitter electrodes and one or more of said ion collector electrodes receives ions from principally one said ion emitter electrodes, said one or more ion collector electrodes that receives ions from principally two ion emitter electrodes being located further downstream from said ion emitter electrodes than said one or more ion collector electrode that receives ions from principally one ion emitter electrode.

16. The electro-kinetic air transporter-conditioner as recited in claim 15, wherein said ion emitting electrodes includes at least one electrode that shares at least one characteristic from a group consisting of (i) a rod-shaped wire, (ii) a spiral coil, (iii) a curved wire, and (iv) a flat spiral wire.

17. The electro-kinetic air transporter-conditioner as recited in claim 15, wherein said ion collecting electrodes includes at least one electrode with a characteristic selected from a group consisting of (i) an elongated cylindrical tube, (ii) an electrode with a U-shaped cross-section, (iii) an electrode with an L-shaped cross-section, (iv) an electrode with a rod-shaped cross-section, and (v) an electrode with a front section and a tail section located at an angle to the front section.

18. The electro-kinetic air transporter-conditioner as recited in claim 15, wherein the air transporter-conditioner further includes a third focus electrode located upstream of said ion emitting electrodes.

19. The electro-kinetic air transporter-conditioner as recited in claim 15, wherein the air transporter-conditioner further includes a trailing electrode located downstream of said ion collecting electrodes.

20. The electro-kinetic air transporter-conditioner as recited in claim 15, wherein two of said ion collector electrodes receive ions from principally two ion emitting electrodes and are located an equal distance downstream from said plurality of ion emitter electrodes.

21. An electro-kinetic air transporter-conditioner, comprising:

a housing having an inlet and an outlet;

a voltage generator disposed within said housing; and

an electrode assembly, electrically connected to said voltage generator, said electrode assembly creates an airflow in a downstream direction from said inlet to said outlet when said voltage generator is energized, said electrode assembly includes:

a first array of electrodes, including at least two electrodes;

a second array of electrodes, including two outermost electrodes, and at least one



electrode located between said outermost electrodes, said electrodes located between said outermost electrodes being located further downstream from said first array of electrodes than said outermost electrodes.

5        22.     The electro-kinetic air transporter-conditioner as recited in claim 21, wherein the air transporter-conditioner further includes a trailing electrode located downstream of second array of electrodes.

23.     An electro-kinetic air transporter-conditioner, comprising:

10                a housing having an inlet and an outlet;  
                  a voltage generator disposed within said housing;  
                  an electrode assembly, electrically connected to said voltage generator, said electrode assembly creates an airflow in a downstream direction from said inlet to said outlet when said voltage generator is energized, said electrode assembly includes:

15                a first array of electrodes, including at least two electrodes;  
                  a second array of electrodes, including two outermost electrodes, and at least one electrode located between said outermost electrodes, said electrodes located between said outermost electrodes being located closer to said outlet than said outermost electrodes.

20        24.     The electro-kinetic air transporter-conditioner as recited in claim 23, wherein said electrodes located between said outermost electrodes are located 2-12mm closer to said outlet than said outermost electrodes.

25.     A device for conditioning air, comprising:

25                a housing having an inlet and an outlet;  
                  an ion generator disposed within said housing that emits ions and that creates an

airflow in a downstream direction from said inlet to said outlet, including:

a first array of ion emitter electrodes;

a second array of ion collector electrodes located downstream of, and staggered in relation to, said first array of ion emitting electrodes;

5 a voltage generator electrically coupled with said first array of ion emitter electrodes and said second array of ion collector electrodes;

wherein said first and second arrays are arranged such that the ions must travel further downstream to reach at least one of said ion collector electrodes than to reach the other of said ion collector electrodes in said second array of ion collector electrodes.

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26. The device as recited in claim 25, wherein the device further includes at least one focus electrode upstream of said ion generator.

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27. The device as recited in claim 25, wherein the device further includes at least one trailing electrode downstream of said ion generator.

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28. The electro-kinetic air transporter-conditioner as recited in claim 25, wherein said array of ion emitting electrodes includes at least one electrode that shares at least one characteristic from a group consisting of (i) a rod-shaped wire, (ii) a spiral coil, (iii) a curved wire, and (iv) a flat spiral wire.

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29. The electro-kinetic air transporter-conditioner as recited in claim 25, wherein said array of ion collecting electrodes includes at least one electrode with a characteristic selected from a group consisting of (i) an elongated cylindrical tube, (ii) an electrode with a U-shaped cross-section, (iii) an electrode with an L-shaped cross-section, (iv) an electrode with a rod-shaped cross-section, and (v) an electrode with a front section and having a tail section located at an angle to the

front section.

30. The electro-kinetic air transporter-conditioner of claim 1 wherein all of the second electrodes are of the same configuration and size.

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31. The electro-kinetic air transporter-conditioner of claim 7 wherein all of the electrodes of the second array of electrodes are of the same configuration and size.

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32. The electro-kinetic air transporter-conditioner of claim 14 wherein all of the second electrodes of the second array of electrodes are of the same configuration and size.

33. The electro-kinetic air transporter-conditioner of claim 15 wherein all of the collector electrodes are of the same configuration and size.

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34. The electro-kinetic air transporter-conditioner of claim 21 wherein all of the electrodes of the second array of electrodes are of the same configuration and size.

35. The electro-kinetic air transporter-conditioner of claim 23 wherein all of the electrodes of the second array of electrodes are of the same configuration and size.

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36. The electro-kinetic air transporter-conditioner of claim 25 wherein all of the collector electrodes are of the same configuration and size.

37. An electro-kinetic air transporter-conditioner comprising:

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a housing having an inlet and an outlet;

a voltage generator;



an electrode assembly electrically connected to said voltage generator, said electrode assembly creates an airflow from said inlet to said outlet when said voltage generator is energized, said electrode assembly including:

a first array of electrodes;

5 a second array of second electrodes located downstream of said first electrode; and  
means for equalizing an electrical field created across the second array.

38. The electro-kinetic air transporter-conditioner of claim 37 wherein each of said second electrodes includes an upstream nose that is closer to the first electrode than the rest of the second electrodes, said equalizing means includes means for equalizing an electrical field created across  
10 the nose of the second electrodes.